

ABSTRACT OF THE DISCLOSURE

The present invention provides an improved surface P-channel transistor and a method of making the same. A preferred embodiment of the method of the present invention includes providing a semiconductor substrate, forming a gate oxide layer over the semiconductor substrate, subjecting the gate oxide layer to a remote plasma nitrogen hardening treatment followed by an oxidative anneal, and forming a polysilicon layer over the resulting gate oxide layer. Significantly, the method of the present invention does not require nitrogen implantation through the polysilicon layer overlying the gate oxide and provides a surface P-channel transistor having a polysilicon electrode free of nitrogen and a hardened gate oxide layer characterized by a large concentration of nitrogen at the polysilicon electrode/gate oxide interface and a small concentration of nitrogen at the gate oxide/semiconductor substrate interface. The method of the present invention is easily incorporated into known fabrication processes and provides an enhanced surface P-channel transistor that resists hot electron degradation, is substantially impermeable to dopants included in overlying layers, and is characterized by a greatly increased extrapolated time dependent dielectric breakdown value.